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ABSTRACT

Presented is a report of a project designed to get teachers to use, make, and instruct from metric materials provided at three workshops conducted in their schools. Teacher and pupil tests were designed to provide a measure of program impact: however, this impact could not be accurately determined from the data collected. (MK)

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MAKING METRIC MATERIALS
The 3M Project

Report 8018

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THE SCHOOL DISTRICT OF PHILADELPHIA

OFFICE OF RESEARCH AND EVALUATION
Federal Evaluation Resource Services

October, 1979

SE 029 665

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Abstract

The Division of Mathematics Education in the School District of Philadelphia has played a leadership role in initiating metric education in Philadelphia and was active in Statewide efforts. Making Metric Materials was an idea that grew out of prior efforts and came into being because of funds provided by the Special Projects Act of the Metric Education Program under the auspices of the Office of Education. The purpose of this project was to get teachers to use, make and instruct from metric materials provided at workshops conducted in their schools. Members of the Mathematics Staff were given training and each was to conduct workshops in elementary or junior high schools. Teacher and pupil tests were developed to provide a measure of program impact after teachers attended three sessions.

During February, 1979 the District initiated a teacher transfer policy to comply with federal standards of minority ratios of teachers. Almost every school experienced changes in teacher staff as a result of this action. Members of the Implementation Team reported that these teacher shifts adversely affected teacher attendance at their second and third workshops. Due to this and other factors described in the report, most teachers did not attend all three sessions of the workshops at their schools. Based upon the data that was collected, the degree of program impact on teachers and pupils could not be accurately determined.

PURPOSE

The funding was designed "to encourage educational agencies and institutions to prepare students to use the revised metric system of measurement (as opposed to the customary system used in the United States) with ease and facility as part of the regular educational program...". The proposal submitted by the Mathematics Division of the School District of Philadelphia was designed to teach Metric education methods and procedures, using workshop techniques with a "hands-on" approach. Teachers were to use these newly developed methods with their pupils.

RATIONALE

The metric system of measurement is presently used throughout the world. The United States, Burma, South Yemen, and Brunei are the only countries still using the English standard system of measurement. Conversion to the metric system is viewed as a needed change if the United States is to compete favorably in foreign trade markets. The United States is switching from the English System to the metric system. Approximately 15% of American industries have already "gone metric," and, as of May 1979, resolutions favoring the metric system have been passed by 34 state boards of education (Newsweek, August 6, 1979). Children currently in school need to be prepared for the change that is now in progress. If children are to be prepared, it is important that key adults in their lives - their parents and their teachers-feel competent and comfortable with metric measurement.

EXPECTED OUTCOMES

Teachers, parents, and students will increase their knowledge of the metric system. Parents and teachers will also increase their knowledge of activities and methods to facilitate their children's development of metric skills. Teachers will construct metric materials for classroom use and attempt to integrate the metric system of measurement into all areas of the curriculum.

PREVIOUS FINDINGS

The School District of Philadelphia, through the Division of Mathematics Education, has produced several metric guides and has initiated instruction in the metric system to school children for several years. However, this was the first year that parent and teacher workshops were instituted and evaluated throughout the city.

EVALUATION

The evaluation team worked closely with the project administrator and personnel to develop project milestone events, project objectives, and needed tests and questionnaires. Tests to assess the degree of knowledge and growth for teachers and pupils were developed and piloted. Project records were reviewed to determine the number of workshops offered, number of participants, and topics covered. The Metric Quotient Test was administered to the staffs of participating schools. The Metric Content Test was administered to pupils participating in the project.

MODE OF OPERATION

Each of the eight district mathematics coordinators was to hold three, two-day workshops in three elementary schools selected from the elementary schools within his/her administrative district. The project coordinator and a teacher on special assignment were each to provide 6 days of workshops to teachers in four junior high schools. This group of ten was the implementation team. A log of topics, dates, and attendance at each workshop session was to be maintained. Teachers, voluntarily, were to attend the workshops during those periods of time when they were not required to teach or they could arrange to bring their classes. In addition to conducting workshops for teachers, the implementation team was to provide workshops to parents and maintain records of the workshops offered.

As a result of attendance at workshops, it was assumed that: 1) teachers in the participating schools would increase their knowledge of the metric system, 2) teachers in the participating schools would implement metric instruction in their classrooms, and 3) pupils of teachers who attended workshops would demonstrate knowledge of and skill in using the metric system.

IMPLEMENTATION

The project was carefully planned and the staff was prepared to initiate the proposed strategies after schools opened in September. The pre-test for teachers was administered at the selected participating schools. Teachers were asked to indicate their roles (e.g., science teacher, grade 1-3) and to print an identifying 4 digit number that would be used on the pretest and posttest to permit comparison of results. This request for an identifying number was met with resistance, and numbers were not provided by many teachers. Though more than 1000 teachers completed the Metric Quotient Test, a 15 item true-false test, a negative attitude may have been generated because of the test administration.

During this critical early period of implementation, the project coordinator was hospitalized for an extended period and had sporadic attendance during the balance of the school year. Although the leadership role was temporarily reassigned, coordination, communication, and direction were inconsistent. The members of the team, who had other major responsibilities, had to assume more responsibility for planning and scheduling. In the meantime, the Philadelphia School System was involved with the transfer of hundreds of teachers to meet federal standards for desegregation. Several members reported fewer workshop participants after the February transfers due to extensive teacher turnover. Reports submitted by the implementation team indicated that fewer teachers than anticipated attended all three of the workshops.

In January the evaluator assigned to the project transferred to another position.

ATTAINMENT OF OBJECTIVES

Objective 1: During the 1978-1979 school year, trained project personnel will: (a) provide three, two-day training sessions to establish metric resource centers in 24 elementary and 8 junior high schools, (b) help teachers integrate the metric system

with curriculum areas other than mathematics, (c) develop a corps of metric consultants in the schools, (d) provide at least 10 metric workshops for parents and other adult groups.

This implementation objective was assessed by a review of project records, and interviews held with the implementation team. Based upon the information made available to the evaluation team, 546 teachers, members of school staffs and parents attended one or more sessions.

Objective 1a, providing training sessions, was not attained. At the elementary school level three training sessions were provided at 13 schools, two sessions at six schools, and only one session at 5 schools. At the junior high school level, two 2-day sessions were provided to three schools and two 3-day sessions were provided at four schools. Presentations focused on metric units of linear, mass/weight, volume/capacity and temperature measurement and on the development of materials and activities for teaching the metric system.

Parents, teachers and other school personnel were all made welcome at the workshop sessions. Attendance at the various sessions varied from 0 to 53 individuals. Logs maintained by the metric implementation team varied greatly in terms of the amount of information recorded. Some members merely noted that a workshop was held, while others gave detailed information about the topics covered, who attended, and what curriculum materials were constructed.

Objective 1b, the degree to which the metric implementation team helped teachers integrate the metric system with curriculum in areas other than mathematics, could not be accurately determined from the review of project records.

Objective 1c, developing a corps of metric consultants in schools, was not attained. However, a list of teachers was developed and submitted for one of the districts.

Objective 1d, planning and providing metric workshops to groups of parents and other adult groups throughout the city, was attained. Parents and other adults were served in two ways: 1) parents of the pupils served were encouraged to attend

the workshops offered to school personnel, and 2) 150 Parent Partnership Mathematics Workshops, whose theme was THE METRIC OF MEASUREMENT, were presented at elementary and secondary schools throughout the city during the week of November 13-17, 1978. A metric booklet was prepared by the school district for use at the workshops. The metric implementation team was actively involved in setting up the parent workshops. Parents felt the workshops were fun to attend, informative, and would assist them in their efforts to help their children learn mathematics.

Objective 2: During the 1978-1979 school year, project teachers will construct and utilize metric measurement instruments and curriculum materails. At least (1) 80% of the elementary and (2) 60% of the secondary teachers will implement at least two "hands-on" activities in their classrooms. Extent of implementation will be verified through observations and interviews with teachers by project personnel. Teachers will complete a questionnaire to document the use and educational effectiveness of metric instruments.

Attainment of this objective could not be determined. Although these activities were observed being performed by teachers, no documentation related to classroom implementation was provided. Due to the lack of supportive data there was no objective way to ascertain the percentage of teachers meeting the criteria.

Objective 3: By May 1979, at least 75% of the participating teachers who did not have mastery of the metric system at the start of the training sessions will improve their knowledge of the metric system to the extent that they will correctly answer at least 80% of the items on the Metric Quotient Test.

Attainment of this objective could not be determined. Prior to attending any of the metric workshops, 1002 teachers were administered the Metric Quotient Test. Of these, approximately 10% did not use an identifying number. For the 15 item true - false test, the pretest mean was 8.35. Science teachers scored highest followed by math teachers and industrial arts teachers. Unfortunately, only 58 tests were completed at the end of the year making it impossible to do any comparisons.

Objective 4: The Metric Content Test will be administered in May to the students of teachers who use the metric resource centers. Included in this group will be mentally or physically handicapped and non-English speaking students. The results will be used to determine mastery levels(s) for various groups of students for the 1979-1980 school year.

The Metric Content Test was developed using an iterative process consisting of item writing and review. The third version was field tested and a final revision was made. The test consisted of 20 multiple choice items. The five areas covered include capacity, weight, temperature, length, and area. One finding determined from several classes during the test development process was that students may have a poor grasp of the use of measurement concepts regardless of the measurement system.

Results of the tests were not encouraging. The four classes which were tested attained a mean of 9.86 items, or half of the items correct. More work will be necessary to develop mastery levels for the test.

SUMMARY AND CONCLUSIONS

The Making Metric Materials Project was instituted to increase parents', teachers', and students' metric system knowledge and skills. This was to be accomplished by conducting metric workshops for teachers at their schools. In turn, teachers were to use their newly acquired skills to provide metric instruction to their students.

Due to the prolonged illness of the project coordinator, several problems developed. The two most serious problems were: 1) aspects of the project were not implemented as planned and 2) documentation of various aspects of implementation were not submitted.

This project was successful in bringing trained instructors, materials and techniques to local school sites. The instructors were able to teach, share, show, and assist those teachers and parents volunteering to attend the sessions.

It must be concluded that this program did not meet the high expectations that were developed due to the many difficulties that have been noted. On the positive side, more than 1000 teachers were pretested and thereby were made sensitive to metric education. Half of this group attended one or more of the 92 workshops that were reported. A teacher test and a pupil test were developed. Metric curriculum guides were developed and refined for teacher use. A 23 page booklet for parents was developed and used at more than 150 parent workshop meetings. On the other hand, the impact on teachers and pupils could not be determined.

LAST NAME & INITIAL

PUPIL I. D. NO. | SCHOOL

ROOM | GRADE | PROGRAM | PG

SEX (F) (M)

NCS Trans-Optic F3450-5432

DIRECTIONS

Print your name, a space, and your first initial in the boxes on the left. Darken in the circles below the letters you wrote in the boxes.

Below are questions about metric measurement. Read each question very carefully and review each of the choices. Darken in the circle of the best answer. If none of the four choices seems to be right, darken in (5). Do the best you can and be sure to do the questions on the other side.

MARKING INSTRUCTIONS

Use black lead pencil only. (No. 2½ or softer)

Make heavy black marks that fill circle completely.

Erase completely any answer you wish to change.

Make no stray marks on this answer sheet.

○ HEADER

a. Most doorknobs are about _____ from the floor. *(1) 2 km (2) 25 cm (3) 1 m (4) 166 dm*	①	②	③	④	⑤
b. The average newborn baby weighs about _____. *(1) 3 kg (2) 200 mg (3) 100 g (4) 15 kg*	①	②	③	④	⑤
c. Water will freeze at _____ . *(1) 25 C (2) 32 C (3) 0 C (4) 5 C*	①	②	③	④	⑤
d. Most basketball players are at least _____. *(1) 1 km (2) 40 dm (3) 4.5 m (4) 2 m*	①	②	③	④	⑤
e. Ocean temperature in the summer is about_____. *(1) 68 C (2) 24 C (3) 75 C (4) 5 C*	①	②	③	④	⑤
f. The small lunch cartons of milk hold about ____. *(1) 80 ml (2) 32 l (3) 1 km (4) 250 ml*	①	②	③	④	⑤
g. The distance of six city blocks is about _____. *(1) 30 cm (2) 6 km (3) 4 m (4) 1 km*	①	②	③	④	⑤
h. Professional football players weigh at least___. *(1) 120 kg (2) 254 g (3) 250 kg (4) 10 kg*	①	②	③	④	⑤
i. An apple of average size weighs about_____. *(1) 1.3 kg (2) 75 g (3) 50 kg (4) 25 mg*	①	②	③	④	⑤
j. The area of a small car door is about _____. *(1) 9 m (2) 10 sq m (3) 5 sq cm (4) 1 sq m*	①	②	③	④	⑤
k. The amount of liquid in a teaspoon is about____. *(1) 14 g (2) 150 ml (3) 25 sq cm (4) 5 ml*	①	②	③	④	⑤
l. One liter of water weighs exactly _____. *(1) 10 kg (2) 1 kg (3) 100 g (4) 50 mg*	①	②	③	④	⑤
m. A new piece of chalk is about _____ long. *(1) 50 cm (2) 10cm (3) 35 mm (4) 10mm*	①	②	③	④	⑤

4/76 PLEASE CONTINUE ON THE OTHER SIDE

THE MULTIPURPOSE SCALE

FORM S702

The School District of Philadelphia
Office of Research and Evaluation

n. The area of this period (.) is about _____. *(1) 1 sq mm (2) 10 mm (3) 1 sq m (4) 25 sq m*	①	②	③	④	⑤
o. Liquids are measured in units called _____. *(1) grams (2) meters (3) centimeters (4) liters*	①	②	③	④	⑤
p. Your shoe is less than _____ long. *(1) 10 mm (2) 9 cm (3) 3 mm (4) 30 cm*	①	②	③	④	⑤
q. The gas tanks in most cars hold about ____. *(1) 10 kl (2) 40 kg (3) 80 l (4) 18 l*	①	②	③	④	⑤
r. A pot of water will boil at ____ . *(1) 179 C (2) 100 C (3) 212 C (4) 32 C*	①	②	③	④	⑤
s. The area of your little finger nail is about___. *(1) 1 sq m (2) 5 cm (3) 1 sq cm (4) 16 cm*	①	②	③	④	⑤
t. A nickel weighs about _____ . *(1) 25 mg (2) 4 kg (3) 5 g (4) 8 mg*	①	②	③	④	⑤
	①	②	③	④	⑤
THANK YOU FOR DOING YOUR BEST.	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤

LAST NAME & INITIAL

PUPIL I. D. NO. | SCHOOL

ROOM | GRADE | PRO-GRAM | PG

SEX

NCS Trans-Optic F3460-54321

DIRECTIONS

Read each statement and decide whether it is likely or not likely to be true. If LIKELY TO BE TRUE, fill in completely circle (1). If NOT LIKELY TO BE TRUE, fill in completely circle (2).

There are 15 questions. Please continue on the other side to complete this survey of your metric quotient.

MARKING INSTRUCTIONS

Use black lead pencil only. (No. 2½ or softer)

Make heavy black marks that fill circle completely.

Erase completely any answer you wish to change.

Make no stray marks on this answer sheet.

HEADER

1. An apple weighs about five grams.	①	②	③	④	⑤
2. The door of a VW "Beetle" has an area of one square meter.	①	②	③	④	⑤
3. A newly born infant weighs about three kilograms.	①	②	③	④	⑤
4. The temperature of the ocean was 68 degrees Celsius.	①	②	③	④	⑤
5. Some basketball players are three meters tall.	①	②	③	④	⑤
6. It started to snow when the temperature dropped to 25 degrees Celsius.	①	②	③	④	⑤
7. The capacity of a cup is 250 millilliters.	①	②	③	④	⑤
8. A football field has an area of 150 square meters.	①	②	③	④	⑤
9. The distance from Philadelphia to New York is 100 kilometers.	①	②	③	④	⑤
10. The area of a postage stamp is about 5 square centimeters.	①	②	③	④	⑤
11. The captain of the football team weighed 120 kilograms.	①	②	③	④	⑤
12. You can measure 15 millilliters with a tablespoon.	①	②	③	④	⑤
13. A liter of water weighs one kilogram.	①	②	③	④	⑤

4/76 PLEASE CONTINUE ON THE OTHER SIDE

THE MULTIPURPOSE SCALE

FORM S702

The School District of Philadelphia
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14. A new piece of chalk is about 50 millliliters long.	①	②	③	④	⑤
15. The oven temperature needed to bake a cake is 230 degrees Celsius.	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤
	①	②	③	④	⑤